Community-Integrated Home-Based Depression Treatment in Older Adults
A Randomized Controlled Trial

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Context Older adults with social isolation, medical comorbidity, and physical impairment are more likely to be depressed but may be less able to seek appropriate care for depression compared with older adults without these characteristics.

Objective To determine the effectiveness of a home-based program of detecting and managing minor depression or dysthymia among older aldults.

Design and Setting Randomized controlled trial with recruitment through community senior service agencies in metropolitan Seattle, Wash, from January 2000 to May 2003.

Patients One hundred thirty-eight patients aged 60 years or older with minor depression (51.4%) or dysthymia (48.6%). Patients had a mean of 4.6 (SD, 2.1) chronic medical conditions; 42% of the sample belonged to a racial/ethnic minority, 72% lived alone, 58% had an annual income of less than $10000, and 69% received a form of home assistance.

Interventions Patients were randomly assigned to the Program to Encourage Active, Rewarding Lives for Seniors (PEARLS) intervention (n=72) or usual care (n=66). The PEARLS intervention consisted of problem-solving treatment, social and physical activation, and potential recommendations to patients' physicians regarding antidepressant medications.

Main Outcome Measures Assessments of depression and quality of life at 12 months compared with baseline.

Results At 12 months, compared with the usual care group, patients receiving the PEARLS intervention were more likely to have at least a 50% reduction in depressive symptoms (43% vs 15%; odds ratio [OR], 5.21; 95% confidence interval [CI], 2.01-13.49), to achieve complete remission from depression (36% vs 12%; OR, 4.96; 95% CI, 1.79-13.72), and to have greater health-related quality-of-life improvements in functional well-being (P=.001) and emotional well-being (P=.048).

Conclusions The PEARLS program, a community-integrated, home-based treatment for depression, significantly reduced depressive symptoms and improved health status in chronically medically ill older adults with minor depression and dysthymia.

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CLINICALLY SIGNIFICANT DEPRESsion affects 15% to 20% of elderly individuals in the United States.[1,2] Older individuals are less likely than younger adults to have major depression[3] but have comparable or higher rates of less severe depressive disorders such as dysthymia and minor depression. Dysthymia is a chronic depressive syndrome persisting for at least 2 years.[4] According to the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (*DSM-IV*) Appendix of Criteria Sets and Axes Provided for Further Study, minor depression is depressed mood and/or significant loss of interest, plus 1 to 3 other depressive symptoms present nearly every day for at least 2 weeks, occurring in the absence of dysthymia.[4(pp719-721)] Minor depression and dysthymia both lead to significant disability.[5,6] Accumulating evidence from primary care set-

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tings suggests that both syndromes may respond to medications and nonpharmacological therapies,[7,8] though less is known about treatment of these disorders, particularly minor depression, in community settings.

Although higher rates of depression exist among medically ill,[9-12] socially isolated,[11,13] homebound,[14-16] or functionally impaired[12,17] older adults, such characteristics may also lead to inadequate recognition and treatment of depression. Even among less functionally impaired older adults attending primary care, few depressed patients receive guideline-level depression treatment[18,19] such as medications or psychotherapy.[20] Untreated depression in elderly persons negatively influences physical functioning,[21] adaptation to medical illness,[22] and quality of life[23] and can be associated with increased morbidity and mortality,[24,25] treatment nonadherence,[26] increased health care costs,[18,26] and lower satisfaction with care.[23,27]

Because of the relatively high prevalence of less severe forms of depression among elderly persons, we set out to add to the evidence base on treating these disorders in community settings by conducting a randomized controlled trial comparing a program for treating minor depression and dysthymia, the Program to Encourage Active, Rewarding Lives for Seniors (PEARLS), with usual care in medically ill, low-income, mostly homebound older adults. Since home-based treatment can reduce depression among socially isolated, chronically ill seniors,[16] we created a home-based intervention focusing on problem-solving treatment (PST). We hypothesized that patients receiving the PEARLS intervention would show greater improvements in depression and higher quality of life compared with patients receiving usual care. We also examined the effects of the intervention on changes in health care utilization.

METHODS

Protocol

This study was conducted in metropolitan Seattle, Wash, and approved by the University of Washington review committee on human subjects. Between January 2000 and May 2003, we sought to enroll adults aged 60 years or older receiving services from senior service agencies or living in senior public housing with *DSM-IV* minor depression or dysthymia diagnostic criteria. Social workers at Aging and Disability Services and Senior Services of Seattle/King County administered the 2-item Primary Care Evaluation of Mental Disorders (PRIME-MD) depression screening tool[28] during routinely scheduled visits or telephone calls. We also recruited self-referred individuals through letters mailed by collaborating agencies to their clients or residents in affiliated public housing. All potential self-referred or screen-positive participants were interviewed by trained research associates using the Structured Clinical Interview for *DSM-IV* (SCID)[29] as a second-level screen. Participants who were eligible and provided written informed consent completed a baseline interview.

We estimated that the intervention and usual care groups would each require 64 patients to have a 95% chance of detecting as significant (at a 2-sided, .05 α level) a mean difference of 0.30 in the depression outcome measure, the Hopkins Symptom Checklist (HSCL) 20, derived from the revised HSCL-90.[30] We planned to enroll 71 patients in each group, anticipating 10% participant attrition.

Agency social workers identified 1238 potential participants, 20% of whom completed the SCID, and the majority of the 181 self-referred potential participants (72%) also completed the SCID (FIGURE). Of 374 potential participants evaluated with the SCID, 224 (60%) had the following exclusion criteria: no depression, 29%; major depression, 21%; bipolar disorder, 4%; psychosis, 2%; and substance abuse, 0.3%. We used 5-minute recall of 3 items and orientation to year, month, and date from the Mini-Mental State Examination[31] to screen for cognitive impairment; patients scoring less than 3 of 6 points (3% of potential participants) were ineligible to participate. Of 150 remaining potential participants (40%), 12 refused participation and 138 consented to participate and were enrolled in the study. For all participants who were excluded because of a diagnosis of major depression, a letter from the study psychiatrist (P.C.) was sent to the partipant's primary care physician indicating the diagnosis and suggesting that he/she consider this probable diagnosis in treatment of the patient.

Randomization

Using a 50:50 randomization allocation ratio, investigators created envelopes containing concealed assignment codes assigned sequentially to eligible patients in blocks of 10 by a research associate. Investigators changed the allocation ratio to 60:40 after 11 blocks to ensure that the desired sample of intervention participants was recruited ($\geq$71 participants). To account for the possibility that clinical severity of recruited participants may have increased over time, which would lead to greater severity in the treatment group, we included a dummy variable in all analyses denoting whether patients were randomized using the 50:50 or 60:40 allocation scheme.

Intervention and Usual Care Participation

Usual care participants received no additional services, but letters sent to their regular physicians and social workers reported their depression diagnosis with recommendations to continue usual care. All participants could seek additional primary or specialty mental health care. Intervention participants were scheduled to receive PST by PEARLS therapists (2 male and 1 female master's-level social workers employed by community agency collaborators). Near the end of recruitment, a female registered nurse trained in PST replaced 1 of the social workers for 1 of 72 intervention participants. Therapists thoroughly reviewed a PST treatment manual,[32] completed 8 hours of lectures, viewed videotapes, and par-

ticipated in extensive role-playing. Problem-solving treatment is a skills-enhancing behavioral depression treatment based on the assumption that problems of daily life cause and maintain depressive symptoms, and through systematically identifying and addressing these problems, patients can achieve decreased depressive symptoms. Recent research has shown it is not necessary for a patient's perception of problem severity to improve for PST to work.[33]

Each PEARLS session included selecting from a list of 250 pleasant activities[34] to engage in before the next session. The inverse relationship between pleasant events and depression is an important aspect of behavioral theories of depression.[35]

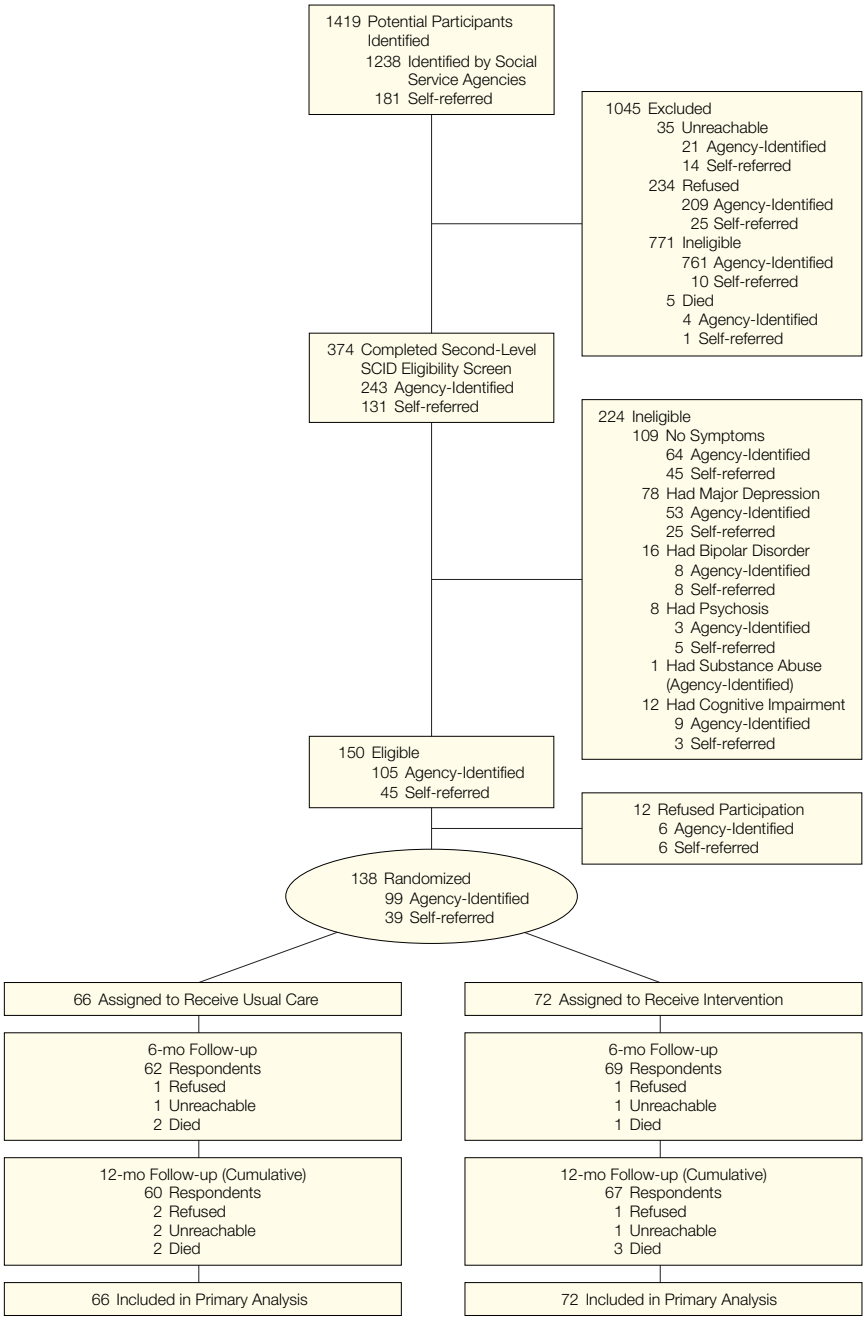
We modified PST sessions to provide greater emphasis on social and physical activation (S.S. and J.K., PEARLS Research Team, unpublished data, January 2000). The goal of physical activation was to assist patients in developing a regular physical activity program consistent with national recommendations[36] for moderate activity of at least 30 minutes' duration at least 5 d/wk. Therapists received information on baseline physical, social, and recreational activities derived from the Community Healthy Activities Model Program for Seniors (CHAMPS) instrument.[37] Physical activation began during the third or fourth PST session, allowing patients to develop familiarity with problem-solving skills. The goal of social activation was to increase patients' interactions outside the home by using a resource list under the guidance of the therapist. Group activities encouraging peer support were given highest priority.

Starting in September 1999, each therapist saw 3 to 6 training cases, and, as with all participants, these participants gave permission for audiotaping sessions. The PST trainer (K.S.) scored every training audiotape on 9 specific and 1 global item from 0 (very poor) to 5 (very good). Feedback for improving adherence to the PST method was provided. Therapists achieving global ratings of at least 3 (satisfactory) on the majority of sessions with 3 training cases were certified as PST proficient and permitted to see full study participants.[38] A research coordinator sent the PST trainer every fifth full study tape for adherence coding and feedback. The mean global rating for 109 sessions was 3.15.

Characteristics of the PST Sessions

Patients were scheduled for eight 50-minute in-home sessions over 19 weeks,

Figure. Flow of Study Participants



SCID indicates Structured Clinical Interview for *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*.

in weeks 1, 2, 3, 5, 7, 11, 15, and 19. Increasing time between later sessions gave patients more opportunities to practice PST skills. The Patient Health Questionnaire 9 (PHQ-9)[28] was administered at the beginning of sessions to track depression change. After 19 weeks, therapists maintained monthly brief telephone contact with patients, during which they would administer the PHQ-9 and assess patients' use of PST.

Depression Management Team Sessions

All intervention cases were reviewed weekly or biweekly by the study psychiatrist (P.C.) during depression management team sessions, which all therapists attended. Therapists carried 3 to 8 active cases and each case required 5 to 10 minutes of discussion and supervision. For cases lacking continued improvement after 4 to 5 weeks (most recent PHQ-9 scores >50% of baseline and continuing or recurring dysphoria or anhedonia), the psychiatrist contacted patients' primary care physicians to recommend initiating or adjusting antidepressants and to assess potential medical and substance abuse etiologies for depression. This is consistent with evidence-based chronic care models using stepped-care targeted communication between specialists and primary care physicians or specialists and patients for cases with unremitting symptoms.[23,39]

The psychiatrist also reviewed medical problems and medications for all patients, occasionally clarifying details by contacting primary care physicians. The psychiatrist infrequently called patients, after discussion at team sessions, to clarify clinical issues (eg, suicidal ideation, diagnostic uncertainty). The availability of such telephone contacts with physicians or patients optimized patient safety and increased the comprehensiveness of the intervention.

Data Collection

Outcome assessments were conducted in person at baseline and at 6 and 12 months by trained interviewers not involved in the intervention and included sociodemographic characteristics and a count of medical conditions. Depression was assessed using the HSCL-20,[25] which is validated in medical patients and found to be highly reliable.[40,41] With a 0-to-4 severity range, an HSCL-20 cutoff score of 1.72 has previously been associated with the highest positive predictive value for diagnosis of major depression in adult primary care patients.[42] Since neuroticism predicts persistence of depression in primary care[43] and an increased risk for late-life depression associated with disability,[44] 7 NEO neuroticism scale[45] items were administered at baseline.

Health-related quality of life in functional, physical, social, and emotional well-being domains was assessed at baseline and 12 months using the Functional Assessment of Cancer Therapy Scale–General (FACT-G).[46] The FACT-G is a generic core questionnaire of 27 items for health-related quality-of-life questionnaires targeted to management of chronic illness and used and validated in cancer, other chronic conditions, and the general population.[47]

Health care utilization was assessed in three 6-month periods from 6 months before to 12 months after baseline using the Cornell Services Index[48] and was dichotomized by creating indicator-dependent variables for each period based on having any emergency department visits, any medical hospitalizations, or at least 5 outpatient visits (median number of baseline outpatient visits). The proportion of patients with any form of home assistance (eg, home aid, nursing, or meal delivery) was determined at baseline.

Patients were asked whether they used antidepressants during all 3 assessments. Six- and 12-month depression outcomes included mean HSCL-20 depression scores; treatment response, defined as at least a 50% decrease in HSCL-20 score from baseline; and complete depression remission, defined as HSCL-20 score less than 0.5.[49] Costs of providing PEARLS were based on direct personnel salaries and included the costs of time to conduct in-person contacts and associated travel time, all therapist and psychiatric telephone contacts, depression management team sessions, and maintenance of PST quality by the PST trainer.

Statistical Analysis

Two-tailed t tests and χ^2 tests were used to compare the intervention and usual care groups at baseline. To evaluate group differences of HSCL-20 and FACT-G domain scores at assessment points, we used mixed-effects regression analyses.[50,51] To evaluate treatment group differences in depression treatment response, depression remission, or health care utilization at all assessment points, we used mixed-effects ordinal regression analyses.[52] These procedures permit inclusion of patients with missing data, ensuring an intention-to-treat analysis as randomized. Age, sex, NEO neuroticism scale score, dysthymia, and randomization allocation scheme were fixed covariates for each analysis. In all models, the intercept was always assumed to be random, and the time effect (baseline, 6 months, and 12 months or baseline and 12 months) was fixed. Marginal maximum likelihood methods generated maximum likelihood estimates for group, time, and group × time interaction effects. Models were evaluated using a z statistic (maximum likelihood estimate divided by standard error). In the case of a nonsignificant group × time interaction, the models were refit without an interaction.

For regression analyses evaluating depression treatment response and depression remission, 6 cases were missing outcome data at both 6 and 12 months, so the method of last observation carried forward was first used,[53] ensuring an intention-to-treat analysis. As a sensitivity analysis, the mixed-effects ordinal regression analysis was run without the 6 cases as a completer analysis, and results were identical.

When significant interaction or group effects were detected in various models, the following were calculated for each follow-up assessment point: for HSCL-20 score differences, multiple re-

gression analyses were used to estimate the adjusted group mean change; and for depression treatment response, depression remission, or health care utilization, logistic regression was used to obtain adjusted odds ratios. For the FACT-G subscales, adjusted mean change scores over the year were computed for each treatment group.

MIXOR, version 2.0, and MIXREG, version 1.2 (Don Hedeker and Robert D. Gibbons, University of Illinois at Chicago) as well as SPSS, version 11.0 (SPSS Inc, Chicago, Ill) were used for analyses. $P<.05$ was considered statistically significant.

RESULTS

Baseline Characteristics

The sample (TABLE 1) consisted mostly of women (79%), and had a mean age of 73 years (SD, 8.5 years). Few patients (11%) were married or living with a partner, and 72% lived alone. Forty-two percent belonged to a racial/ethnic minority (African American, 36%; Asian American, 4%; Hispanic, 1%; and American Indian, 1%), 58% had an annual income of less than $10 000, 42% had an education level below or equivalent to high school, and 69% received home assistance.

About half of patients (48.6%) had dysthymia and half (51.4%) had minor depression, with a sample mean HSCL-20 score of 1.3 (SD, 0.5), which is consistent with subthreshold depression and lower than the score (1.72) previously associated with major depression in primary care.[42] Patients reported having a mean of 4.6 (SD, 2.1) of 10 chronic medical conditions (median, 5.0; range, 0-10; 4 had no chronic medical conditions). Since the intervention group had significantly more dysthymia than the usual care group (61% vs 35%; $\chi^2_1=9.5$; $P=.002$) and less neuroticism (NEO neuroticism scale range, 1-5; mean scores, 2.9 [SD, 0.7] vs 3.1 [SD, 0.7]; $t_{136}=2.1$; $P=.04$), we controlled for these differences in subsequent analyses. There were no significant baseline differences in cognitive screening or in health care utilization in the prior 6 months in the domains of mental health, medical outpatient and emergency department use, medical hospitalizations, or use of home assistance.

Process of Care

Intervention patients received, during the 19-week active phase, a mean of 6.6 visits (SD, 2.5; median, 8.0; range, 0-8; 3 had no visits) and, during the 33-week follow-up phase, a mean of 3.5 telephone contacts (SD, 2.7; median, 5.0 contacts; range, 0-7; 23 patients could not be or asked not to be contacted). No patients were seen in person by the psychiatrist. However, the psychiatrist made 52 telephone contacts during the intervention, 37 with patients' physicians to discuss the following: antidepressant recommendations (19), laboratory tests (10), cognition (7), other medications (4), alcohol abuse rehabilitation (2), sleep apnea (1), falls (1), and pain complaints (1). Fifteen antidepressant-related calls occurred during the active phase and 4 during the follow-up phase and involved care of 14 patients. Eleven calls (8 in the active and 3 in the follow-up phases) were recommendations to start an antidepressant, and 8 (7 in the active and 1 in the follow-up phases) were recommendations to adjust medications. Nine psychiatrist calls were made to patients to assess study participation (7), suicidal thoughts (1), and confusion (1). One call to a pa-

Table 1. Baseline Participant Characteristics*

Characteristics	Usual Care (n = 66)	Intervention (n = 72)	Total (n = 138)
Self-referred to PEARLS	21 (31)	18 (25)	39 (28)
Female	50 (76)	59 (82)	109 (79)
Age, mean (SD), y	73.5 (8.5)	72.6 (8.4)	73.0 (8.5)
Living alone	43 (65)	56 (78)	99 (72)
Married or living with partner	7 (11)	8 (11)	15 (11)
Racial/ethnic minority	28 (43)	30 (42)	58 (42)
Education beyond high school	38 (58)	42 (58)	80 (58)
Household income <$10 000 annually	33 (51)	45 (64)	78 (58)
HSCL-20 score, mean (SD) (range, 0-4)	1.2 (0.5)	1.3 (0.5)	1.3 (0.5)
Depression status (SCID diagnosis)			
Dysthymia	23 (35)	44 (61)	67 (49)
Minor depression	43 (65)	28 (38)	71 (51)
Current antidepressant treatment	20 (30)	29 (40)	49 (36)
NEO neuroticism scale score, mean (SD)	3.1 (0.7)	2.9 (0.7)	3.0 (0.7)
No. of chronic diseases (of 10 total), mean (SD)	4.6 (1.9)	4.5 (2.2)	4.6 (2.1)
Cognitive screening score (of 6 items from the MMSE), mean (SD)	5.5 (0.1)	5.5 (0.1)	5.5 (0.1)
Health care utilization			
Outpatient visits in past 6 mo, mean (SD)	5.5 (5.4)	7.0 (8.4)	6.3 (7.1)
Any mental health visits in past 6 mo	5 (8)	7 (10)	12 (9)
Any medical hospitalizations in past 6 mo	19 (29)	20 (28)	39 (28)
Any emergency department visits in past 6 mo	25 (38)	29 (40)	54 (39)
Any home nursing, home aid, or home meals in past 6 mo	48 (73)	46 (65)	94 (69)
Moderate exercise, mean (SD), h/wk†	1.7 (3.9)	1.1 (2.6)	1.4 (3.2)
FACT-G score, mean (SD)			
Functional well-being	2.0 (0.7)	1.7 (0.7)	1.9 (0.7)
Emotional well-being	2.8 (0.7)	2.7 (0.7)	2.8 (0.7)
Physical well-being	2.7 (0.7)	2.8 (0.7)	2.8 (0.7)
Social/family well-being	2.4 (1.0)	2.2 (1.1)	2.3 (2.1)

Abbreviations: FACT-G, Functional Assessment of Cancer Therapy Scale–General; HSCL, Hopkins Symptom Checklist; MMSE, Mini-Mental State Examination; PEARLS, Program to Encourage Active, Rewarding Lives for Seniors; SCID, Structured Clinical Interview for *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*.
*Data are presented as No. (%) unless otherwise indicated.
†Moderate exercise was defined as walking briskly, jogging, dancing, golfing, playing tennis, performing heavy housework, gardening, bicycling, swimming, or doing aerobics.

Table 2. Depression Outcome Measures

Outcome Measures	Unadjusted Estimates		Treatment Difference	
	Usual Care (n = 66)	Intervention (n = 72)	Coefficient or Odds Ratio (95% CI)*	*P* Value
HSCL-20 depression score, mean (SD) (range, 0-4)				
Baseline†	1.2 (0.5)	1.3 (0.5)	–0.06 (–0.23 to 0.11)	.48
6-mo Follow-up	1.17 (0.53)	0.71 (0.60)	–0.41 (–0.70 to –0.29)‡	<.001
12-mo Follow-up	1.01 (0.46)	0.82 (0.62)	–0.19 (–0.40 to –0.02)‡	.03
Response (≥50% decrease in HSCL-20 depression score from baseline), No. (%)				
6-mo Follow-up	5 (8)	37 (54)	14.2 (4.65 to 43.66)	<.001
12-mo Follow-up	9 (15)	29 (43)	5.21 (2.01 to 13.49)	<.001
Complete remission of depression symptoms (HSCL-20 score <0.5), No. (%)				
6-mo Follow-up	6 (10)	30 (44)	7.39 (2.62 to 20.85)	<.001
12-mo Follow-up	7 (12)	24 (36)	4.96 (1.79 to 13.72)	.002

Abbreviations: CI, confidence interval; HSCL, Hopkins Symptom Checklist.
*Adjusted analysis for intervention vs usual care, adjusted coefficient (linear regression) for HSCL-20 depression scores or odds ratio (logistic regression) for response and complete remission, and 95% CI. Regression models were adjusted for age, sex, baseline neuroticism, baseline dysthymia, randomization allocation scheme, and baseline HSCL-20 depression score.
†Baseline data are mean (SD) scores, mean (95% CI) difference, and *P* value for the mean difference, derived from baseline *t* test differences without covariates.
‡Coefficients.

tient's case manager addressed the patient's living situation, and 1 call to Adult Protective Services initiated an assessment of suspected elder abuse.

At baseline, 36% of patients were taking antidepressants with no significant group differences at baseline and at 6 and 12 months. Seven patients (9.7%) in the intervention group compared with 4 (6.1%) in the usual care group started an antidepressant, while 5 (6.7%) in each group stopped an antidepressant during the study. With a definition of psychosocial interventions as "visits with a counselor, therapist, psychotherapist, or mental health provider," 4 usual care patients reported visits during the first 6 months, 3 reported such visits in both 6-month periods, and 3 reported visits in the last 6-month period.

Intervention Outcomes

For HSCL-20 depression score, there was a significant group × time interaction (z=–2.40; P=.02) due to significant group differences in HSCL-20 at 6 months (t=–4.85; P<.001) and 12 months (t=–2.20; P=.03) (TABLE 2). For depression treatment response and depression remission, there were no significant group × time interactions (z=–1.91; P=.06 and z=–0.90; P=.37, respectively), so the models were refit, resulting in significant group effects (z=4.19; P<.001 and z=3.00; P=.003, respectively) and nonsignificant time effects (z=–0.45; P=.65 and z=–0.82; P=.41, respectively). Table 2 shows that these significant group effects are due to the odds of a 50% depression treatment response or of complete remission being significantly higher for the intervention group at 6 and 12 months.

There were significant group × time interactions for the FACT-G functional well-being (z=3.22; P=.001) and emotional well-being (z=1.97; P=.048) domains at 12 months. For functional well-being, these results were due to a significant mean change in the intervention group's scores (0.52; 95% confidence interval [CI], 0.29-0.74) but not in that of the usual care group (0.09; 95% CI, –0.14 to 0.33) over 12 months. For emotional well-being, these results were due to a significant mean change in the intervention group's scores (0.33; 95% CI, 0.14-0.52) but not in that of usual care group (0.11; 95% CI, –0.09 to 0.31) over 12 months. For FACT-G social and physical well-being, there were no significant group × time interactions or time or group effects.

For emergency department visits and medical outpatient visits there were no significant group × time interactions (z=–0.25; P=.80 and z=–1.29; P=.20, respectively), so models were refit for main effects; there were still no group effects (z=–1.09; P=.28 and z=–0.18; P=.86, respectively) or time effects (z=–1.32; P=.19 and z=–1.19; P=.23, respectively). For hospitalizations, there was no group × time interaction (z=–0.70; P=.48); with refit models there was no time effect (z=0.57; P=.57), but there was a trend-level group effect (z=–1.82; P=.07) (TABLE 3).

Program Costs

Mean costs per patient of providing the PEARLS intervention were $422 for PST sessions, $28 for follow-up telephone calls, $12 for psychiatric telephone calls, $87 for psychotherapy quality assurance, and $81 for depression management team sessions. Total mean cost per patient was $630.

COMMENT

The PEARLS intervention resulted in significantly lower severity and greater remission of depression compared with usual care at 6 and 12 months. Six-month outcomes are comparable with those of a multisite trial of elderly primary care patients with major depression or dysthymia that included PST, in

which more than 65% of intervention patients took antidepressants by 6 months[23] compared with less than 40% in PEARLS. A nonsignificant increase in depression in the intervention group by 12 months may have resulted from a significant decrease in therapist-guided problem solving and physical and social activation in these relatively disabled and socially isolated individuals, though the influence of decreased nonspecific supportive contact with therapists in the follow-up period cannot be ruled out as contributing. Future studies may benefit from extra PST sessions, focusing on activation, in patients relapsing or not remitting during follow-up. On the other hand, a previous study of younger primary care patients with major depression has shown 6 sessions of PST over 11 weeks to be effective[54]; it is possible that patients responding more quickly to the PEARLS intervention (in the active phase) may be able to switch to monthly telephone check-ins earlier in treatment.

Relatively few patients initiated antidepressants and no net increase in antidepressant use occurred between groups. Adequacy of dosing may have been better and duration of use longer in intervention patients, but we report only categorical use of antidepressants over 6-month periods. Ensuring timely antidepressant refills and providing greater patient and physician education about dealing with adverse effects and stigma related to antidepressants may further enhance adequacy in this effectiveness intervention.

Despite the significant effect of the PEARLS intervention, only a third of patients in the intervention group and 12% in the usual care group experienced remission. This is similar to other late-life depression studies using antidepressants and psychotherapy[23] and may result from a reduced capacity of such patients to respond fully to depression treatment. Psychosocial conditions that increase the risk for depression (eg, low income, disability, social isolation) are not likely to have changed substantially during the intervention.

Table 3. Health Care Utilization in Usual Care vs Intervention Groups

Health Care Utilization	Usual Care, No. (%) (n = 66)*	Intervention, No. (%) (n = 72)*
≥5 Outpatient visits in prior 6 mo		
Baseline	30 (46)	40 (56)
6-mo Follow-up	26 (43)	27 (40)
12-mo Follow-up	28 (47)	29 (43)
Any emergency department visits in prior 6 mo		
Baseline	25 (38)	29 (40)
6-mo Follow-up	22 (36)	17 (25)
12-mo Follow-up	19 (32)	22 (33)
Any hospitalizations in prior 6 mo†		
Baseline	19 (29)	20 (28)
6-mo Follow-up	21 (34)	15 (22)
12-mo Follow-up	21 (35)	18 (27)

*Percentages are based on available data.
†Based on mixed-effects ordinal regression analyses, group effect, $z = -1.82$; $P = .07$; time effect, $z = 0.57$; $P = .57$; and group × time interaction, $z = -0.70$; $P = .48$.

Our program resulted in significant improvements in functional well-being (eg, acceptance of illness, enjoyment of recreational activities) and emotional well-being (eg, increased satisfaction in coping with chronic conditions) at 12 months. Despite our focus on physical and social activation, quality of life in physical and social well-being domains did not differ significantly between groups, possibly because of significant physical disability and social isolation in this population.

Recent studies suggest that depression is associated with higher health care costs and utilization among the elderly. Unützer et al[18] have shown that depression is associated with higher ambulatory medical costs in older adults over 4 years. A recent study of 9000 elderly patients screened for a depression trial by Katon et al[55] demonstrated 47% to 51% higher total ambulatory and inpatient medical costs in depressed compared with nondepressed patients after adjustment for chronic medical illness. We found trend-level group differences, with the intervention group less likely than the usual care group to report having any medical hospitalizations during the study period. Depressed patients report more physical symptoms,[22] and untreated depression may result in poorer medical outcomes in patients with cardiovascular disease,[56,57] diabetes,[58,59] and other chronic illnesses. Such factors may have contributed to a greater likelihood of hospitalizations in patients in whom depression was less effectively treated, and this should be explored further in studies with larger sample sizes.

While our therapists worked for the participating community agencies, the intervention, including team meetings, was provided as a parallel health service to usual case management. We believe PEARLS can be disseminated within community agencies already providing care for isolated, low-income older adults by adding depression management to established case management. Most social service agencies have psychiatric and mental health consultants who, with minimal training, could provide appropriate oversight and quality assurance of case managers also trained to provide the PEARLS intervention, and deliver targeted brief telephone communication with physicians and, possibly, with patients with more severe or complex depression (eg, significant medical or psychiatric comorbidity or suicidal ideation).

There were several limitations to this study. The sample size was moderate and limited to 1 urban geographical area. Similar multisite studies in larger, more representative samples would improve generalizability. Also, in this study we did not have access to automated health care records, relying instead on self-reported medical comor-

bidity and health care utilization, which is susceptible to social desirability and recall biases. However, use of retrospective reports of health care utilization has been found to yield valid results,[60-63] and recall bias may have been reduced by our assessment of categorical use of any services vs none in the domains of emergency department and hospital utilization. Future studies using Medicare utilization data or automated pharmacy data will improve assessment of health care utilization and adequacy of medications and allow for cost-effectiveness analyses of the PEARLS intervention. Future studies will also be invaluable in determining the relative contribution of the intervention's components—PST, behavioral/social activation, pleasant activity scheduling, antidepressant use, and supportive contact with therapists—in successfully decreasing depression severity. Finally, despite random assignment, we had unequal baseline proportions of dysthymia and minor depression, with intervention participants having a greater proportion of dysthymia at baseline compared with usual care participants. We controlled for this difference in baseline dysthymia prevalence in all subsequent analyses.

This is one of the first studies to show that by partnering with community agencies, it is possible to target and effectively treat depressed, frail, elderly adults using primarily nonpharmacological treatments such as psychotherapy. Dissemination of PEARLS within existing community social service programs has the potential to significantly improve the well-being and function of depressed older adults served by these programs.

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Study concept and design: Ciechanowski, Wagner, Schmaling, Schwartz, Kulzer, Gray, Collier.
Acquisition of data: Ciechanowski, Wagner, Schmaling, Schwartz, Williams, Kulzer.
Analysis and interpretation of data: Ciechanowski, Wagner, Schmaling, Schwartz, Williams, Diehr, Kulzer, Gray, Collier, LoGerfo.
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Statistical expertise: Ciechanowski, Williams, Diehr.
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For me, words are a form of action, capable of influencing change.
—Ingrid Bengis (1944-)